Beyond the Renewable Fuels Standard: Continuing to Grow Demand

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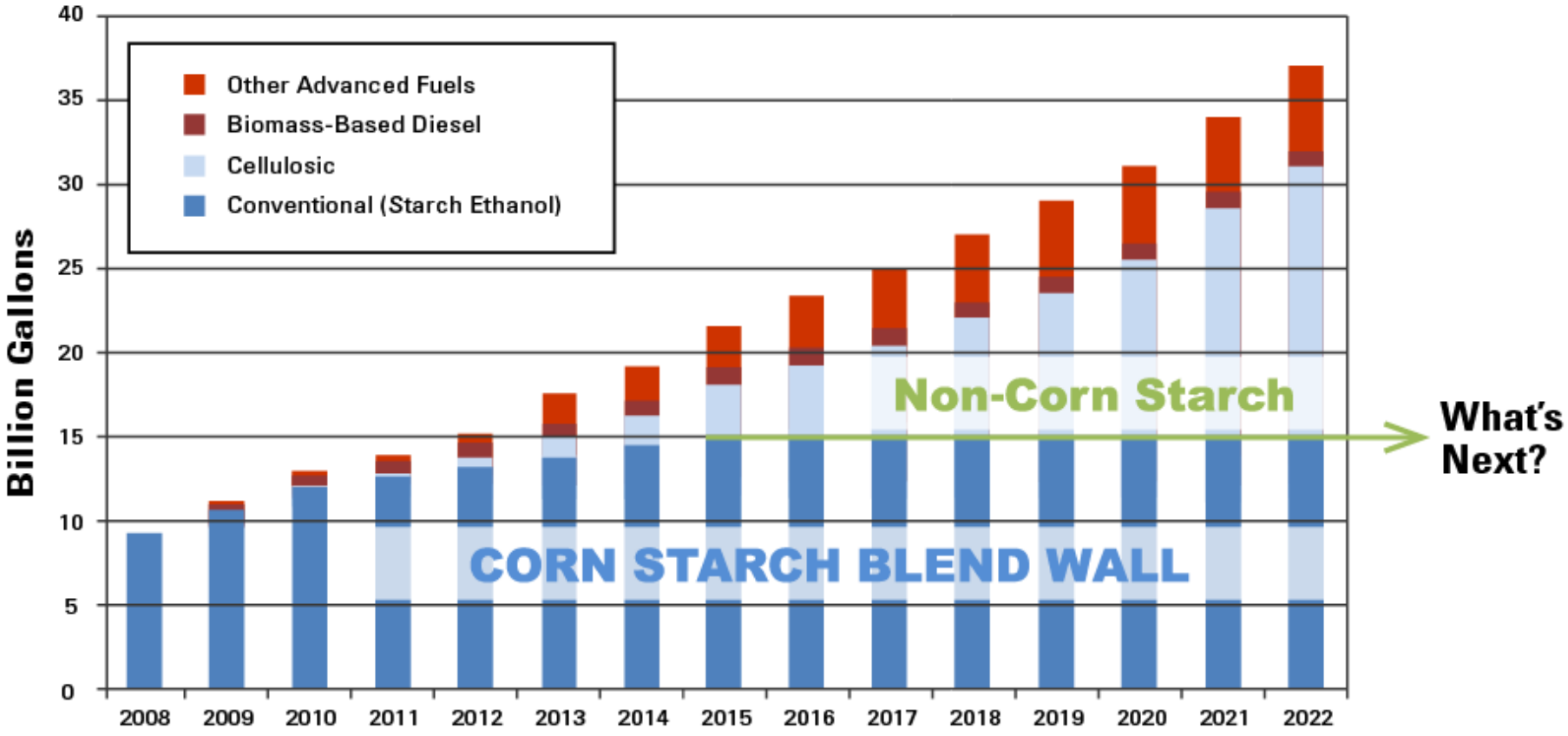
Tapping into the 100 BGPY Market Beyond RFS

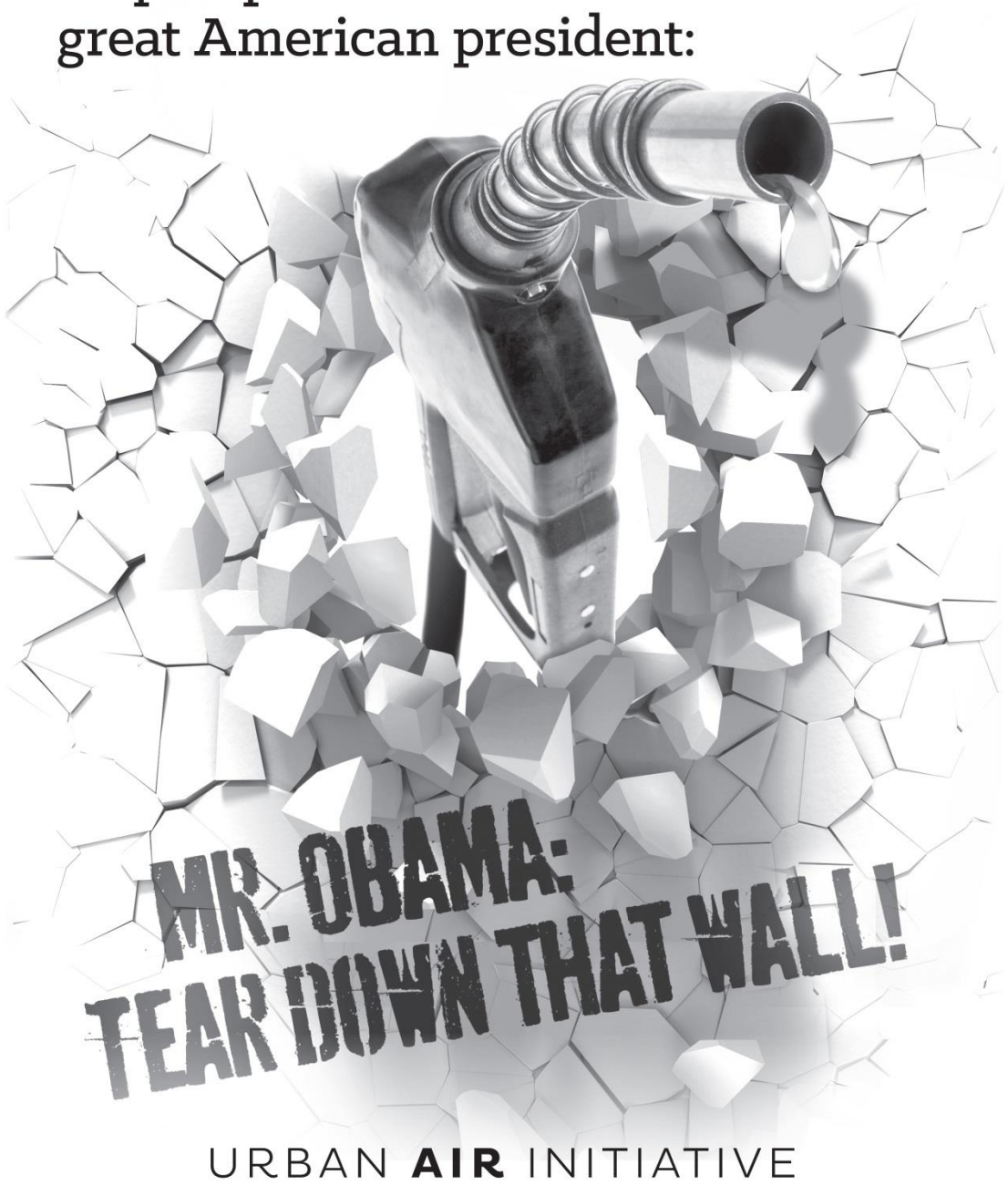
- The RFS program is a solid footing in the fuel market but current law caps corn ethanol at near current levels and has peaked as a market driver
- DOE/EIA Quarterly Energy Outlook predicts little growth for 2016 & 2017
    - They assess current law, incentives, and other factors and have concluded there is nothing driving additional demand
- We must drive that demand ourselves—and we can.
- Extremely unlikely to get corn ethanol starch cap lifted to allow it to qualify as advanced


Billion Gallons
40
35
30
25
20
15
10
5
0
Other Advanced Fuels
Biomass-Based Diesel
Cellulosic
Conventional (Starch Ethanol)
Non-Corn Starch
What's Next?
CORN STARCH BLEND WALL
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022

Tapping into the Market (continued)

- So, if not renewable as a driver, then what?
  - Low Carbon
  - Octane
  - Fuel Economy/Efficiency
  - Health Benefits
  - Price
- Ethanol can make major, significant contributions to addressing all these issues, **if it has access to the market!!!**
- That access is blocked by EPA but the wall is slowly being dismantled, and we know which bricks to pull out

To paraphrase another great American president:



Connecting the Dots: Low Carbon Fuels, Octane, and CAFE

- Carbon reduction is the new black
- Recent Paris accords = 170 countries agreeing to cuts
- The new CAFÉ standards are CO2 driven
- States are calling for huge, perhaps unrealistic reductions
  - California's <20% LCFS already at risk
    - Designed the program to over comply in early years & bank credits
    - Overestimated both biodiesel (25%) and E85 (1 bgpy)
    - As in the federal program, overestimated EV penetration
- But that's good news with models opening up and creating a pathway for corn ethanol. Would impact OR & WA
- CFDC working with UAI, ACE/Ron Alverson on new data to EPA showing significant improvements in CI = to advanced of 50%

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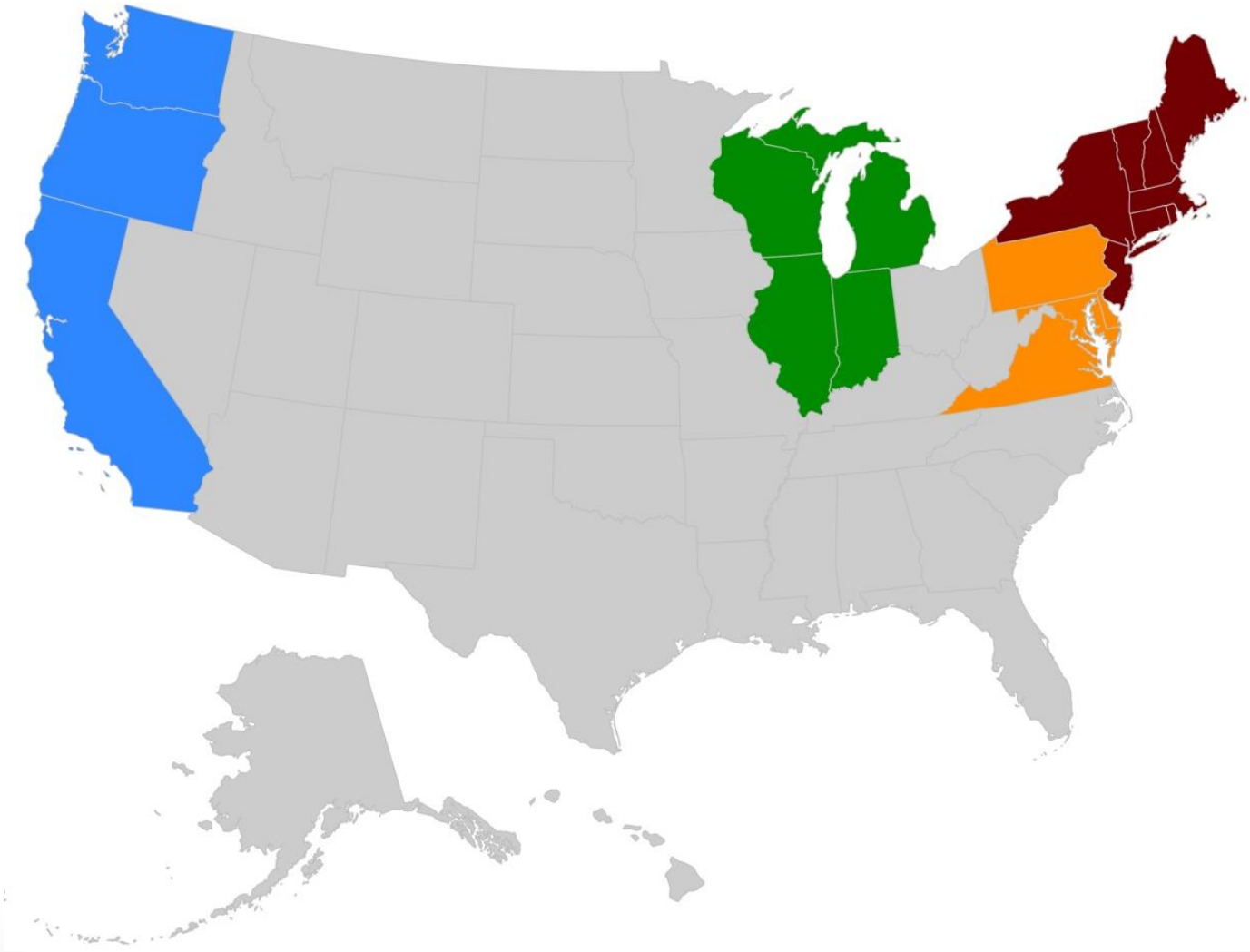
Potential Widespread State Adoption of LCFS



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Some Unique Aspects of LCFS

- Carbon credits are monetized, tradeable currency
- One credit = reducing 1 ton of CO2
  - Recently peaked at $132 per ton
  - New study by UAI makes the case for <350 million ton with E30
- Carbon reduction is a global effort with a global market
- Intersource trading recognizes reduction from any source
- It is driving staggering investment in other sources – Warren Buffett led effort of $3.6 billion in solar for Iowa utilities
- Democratic administration could ramp up war on coal

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Ethanol = Low Carbon Octane & Value to Automakers

- Chrysler: “Not an automaker today who is not concerned with octane” (2014)
  - “GHG reductions and CAFE the most daunting challenge to them in the last 30 years”
- “Need new minimum for octane”
  - “Need to take that story to EPA”
- Mercedes: E30/high octane = “ridiculous power and performance”

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Low Carbon Octane & Value to Automakers

Chrysler (2012): Ethanol offers low carbon content and less GHG emissions... and offers most expedient and least expensive means to lessen CO2 for liquid fuels.

General Motors (2012): Ethanol can be used to produce new, higher octane fuels that can be used more efficiently... using ethanol to increase octane of fuels could be a cost effective means of to reduce GHG...

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Getting Value to Automakers & the Market Access We Need

With simple regulatory changes EPA could turn this entire situation around, including:

- Correct the MOVES Model that could block higher ethanol blends
  - Faulty test & certification procedures paint inaccurate emissions
  - States required to use this model in SIPs
  - UAI/EFC, KS, NE challenge dismissed only due to attainment
  - Several avenues remain open to stop this model
- Update & correct lifecycle analysis – UAI IG Report
- Reinstate/increase vehicle credits – dependent on above
- Raise minimum octane/enforce toxics limits
- Streamline certification process, e.g. E30
- Lift seasonal RVP restrictions

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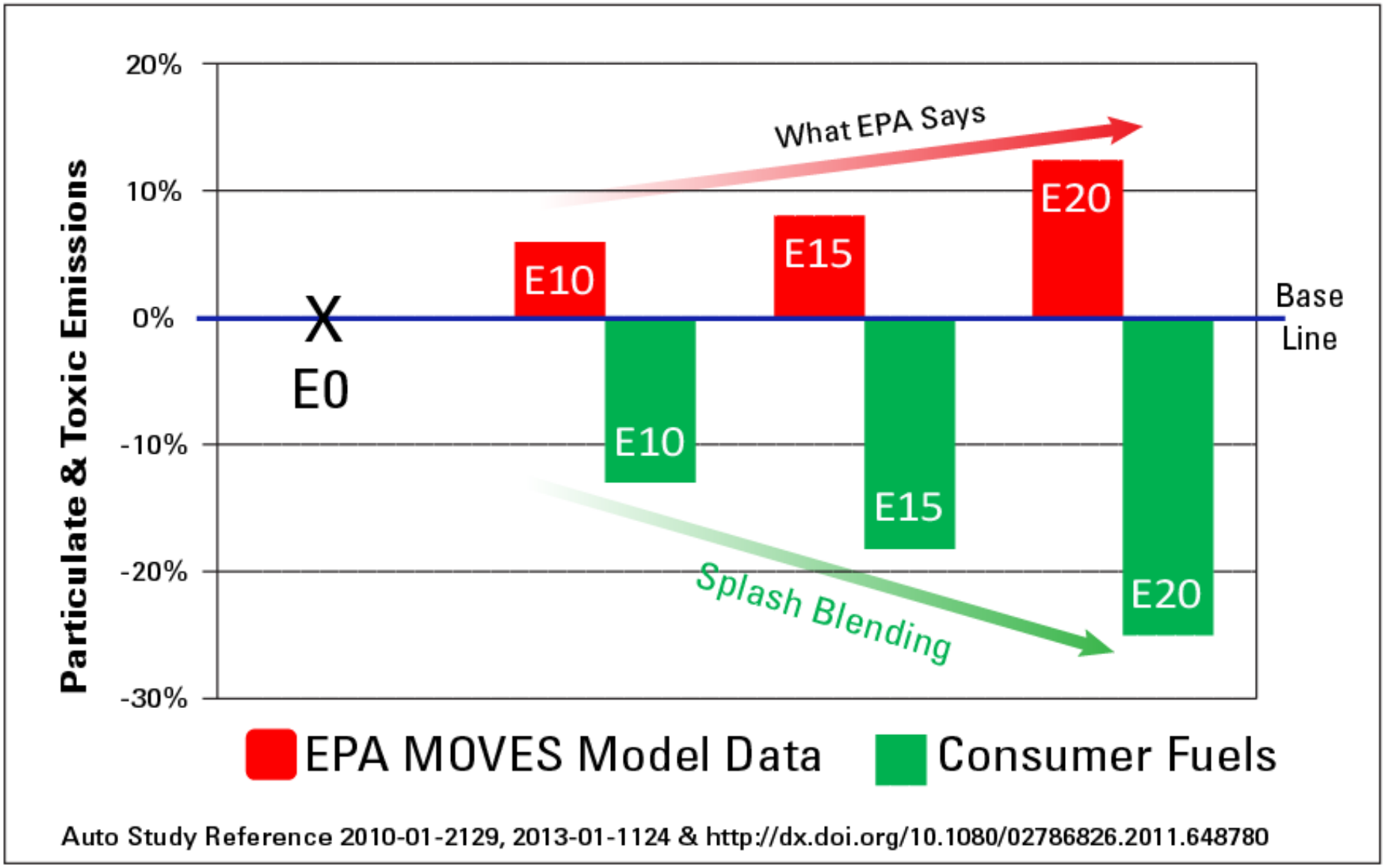

Auto Study Reference 2010-01-2129, 2013-01-1124 & http://dx.doi.org/10.1080/02786826.2011.648780

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RVP is a Non-issue

An extensive set of vapor pressure data for ethanol blends with market gasolines and blendstocks of varying volatility (ASTM D4814 Class AA to Class E) [12] was reported in the study by API [4]. RVPs for blends of ethanol in three representative gasoline blendstocks spanning a wide range of volatility classes are shown in Figure 1.

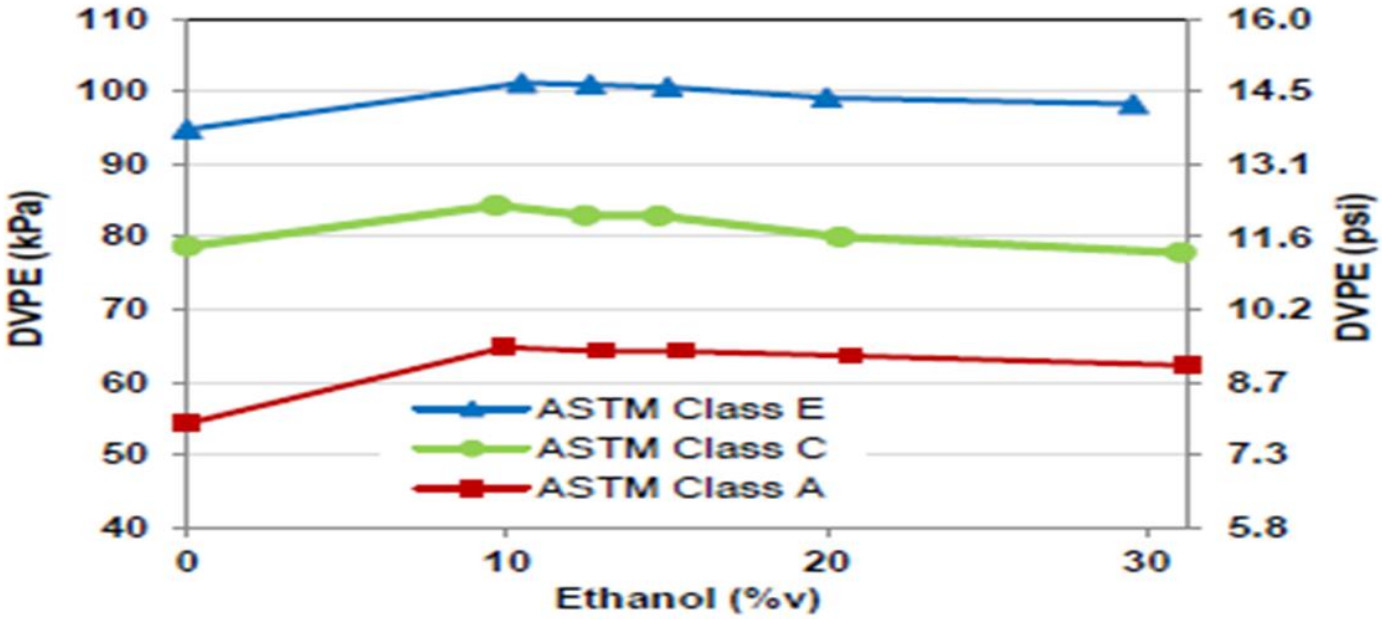

Figure 1 – Reid vapor pressures (Dry Vapor Pressure Equivalent) for ethanol-gasoline blends of varying volatility [4]. The ASTM volatility classes shown are for the base gasoline without ethanol (E0).

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Critical Importance of Meaningful Vehicle Credits

- First gen FFV credits produced 20M FFVs
- Under current system they are phasing out
- Not only no incentive to OEMs but the skewed EV incentives force them to make EVs over FFVs
- Auto industry calling for credits **and pro-rate them** to allow for levels below E85 like E25 & E30
- The more successful we are in improving ethanol CI, the more valuable those credits become, and the more valuable ethanol becomes

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Then What?

- We believe automakers would immediately produce vehicles that maximize the high octane and low carbon of ethanol
- Auto-Ag-Ethanol Working Group making great progress
- Mid-term evaluation of the “new” CAFE rule may be an outstanding opportunity to bring the value of MLEBs to the debate
  - Autos are facing the “daunting challenge” made more difficult by failed assumptions for oil, EVs, consumers, etc.
  - Fuel economy now a hybrid of mileage and GPM with a huge jump from 35 MPG to 54 and defined CO2 reductions
  - Benefits of high octane, low carbon ethanol need to be part of that discussion
  - DOE/Optima/labs already endorsing the use of MLEBs

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Protecting Public Health & Enforcing the Law

- Petroleum-derived octane has the most expensive, energy intensive, and harmful compounds in oil – toxic aromatics
- The BTX group includes known and suspected carcinogens
- UFPs linked to a range of respiratory & neurological problems
- EPA has the authority **and the obligation** to limit under CAA
  - A 2007 review acknowledged ethanol but said not enough!
- Mounting body of evidence of near-roadway exposure risks
- Aromatics the cause of evap & other emission issues attributed to ethanol due to permeation and material degradation
- An octane increase, with an aromatics cap opens the door for higher ethanol blends, assuming the MOVES Model and other obstacles are resolved

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Conclusion: Great Market Opportunities Exist

- Low carbon fuel programs can be a major opportunity
- With increasing concerns over air quality, position Ethanol as a healthier, more efficient fuel
- New ozone standards and federal RFG
  (RFG has aromatic cap and no RVP waiver)

We can help the auto industry meet their requirements, they provide the cars to allow us to actually use the fuel, the pumps and infrastructure will follow, and we know we can produce the fuel.

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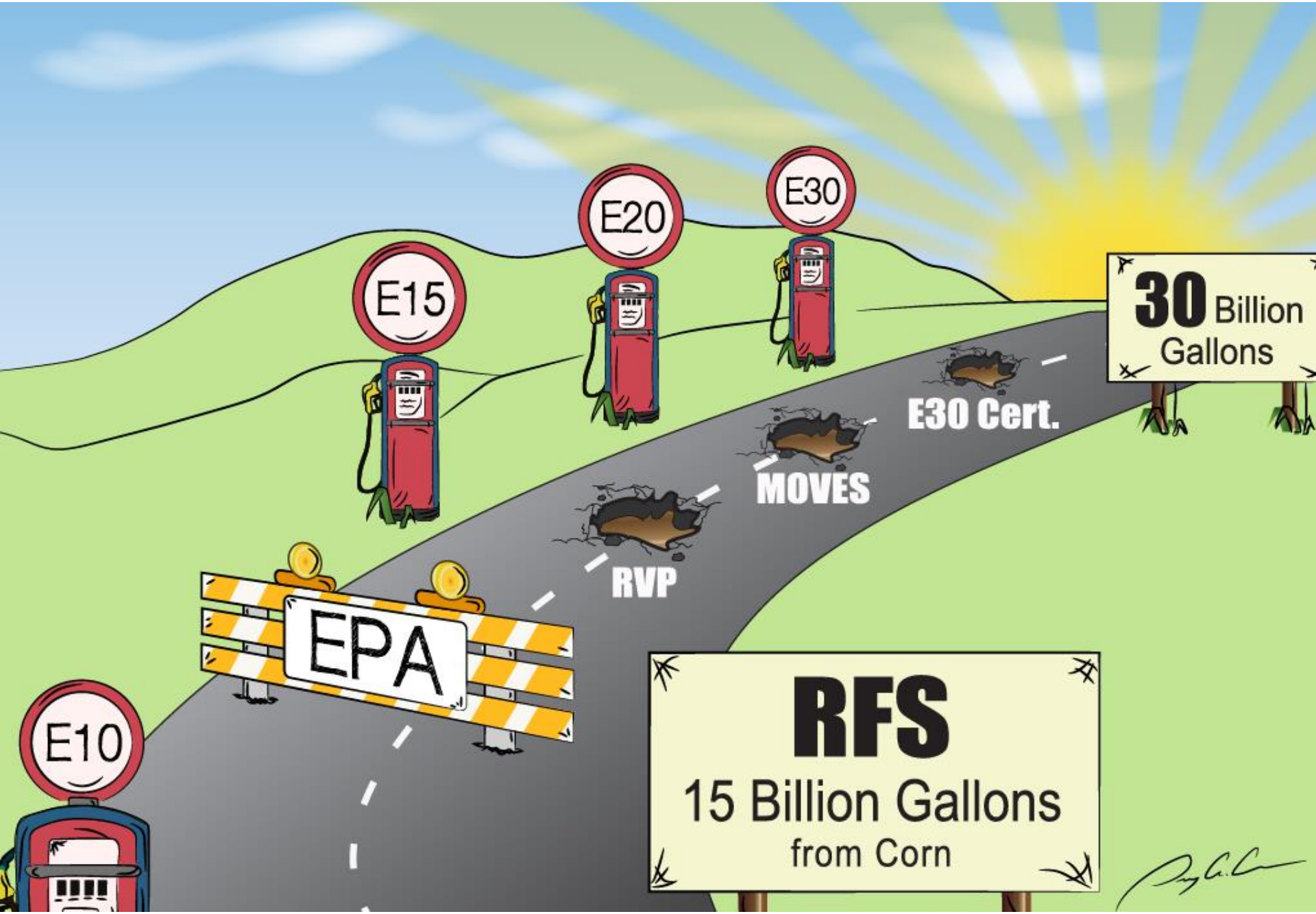
E10
E15
E20
E30
EPA
RVP
MOVES
E30 Cert.
30 Billion Gallons
RFS
15 Billion Gallons
from Corn

Thank You

For more information, visit:

www.cleanfuelsdc.org

www.urbanairinitiative.com

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